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FIG.1

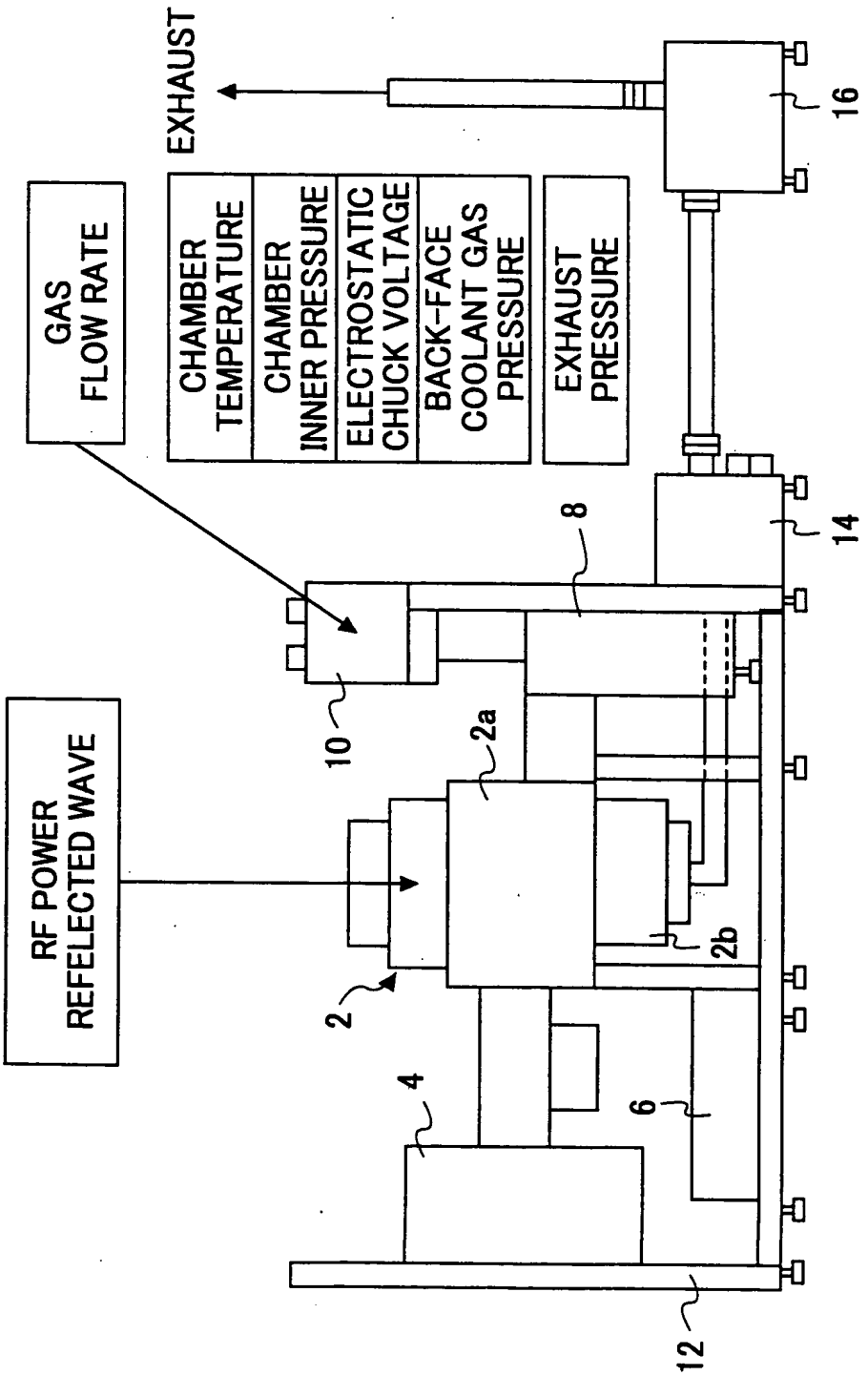

EXHAUST
16
GAS FLOW RATE
CHAMBER TEMPERATURE
CHAMBER INNER PRESSURE
ELECTROSTATIC CHUCK VOLTAGE
BACK-FACE COOLANT GAS PRESSURE
EXHAUST PRESSURE
14
8
RF POWER REFELECTED WAVE
10
2a
2b
2
4
6
12

FIG.2

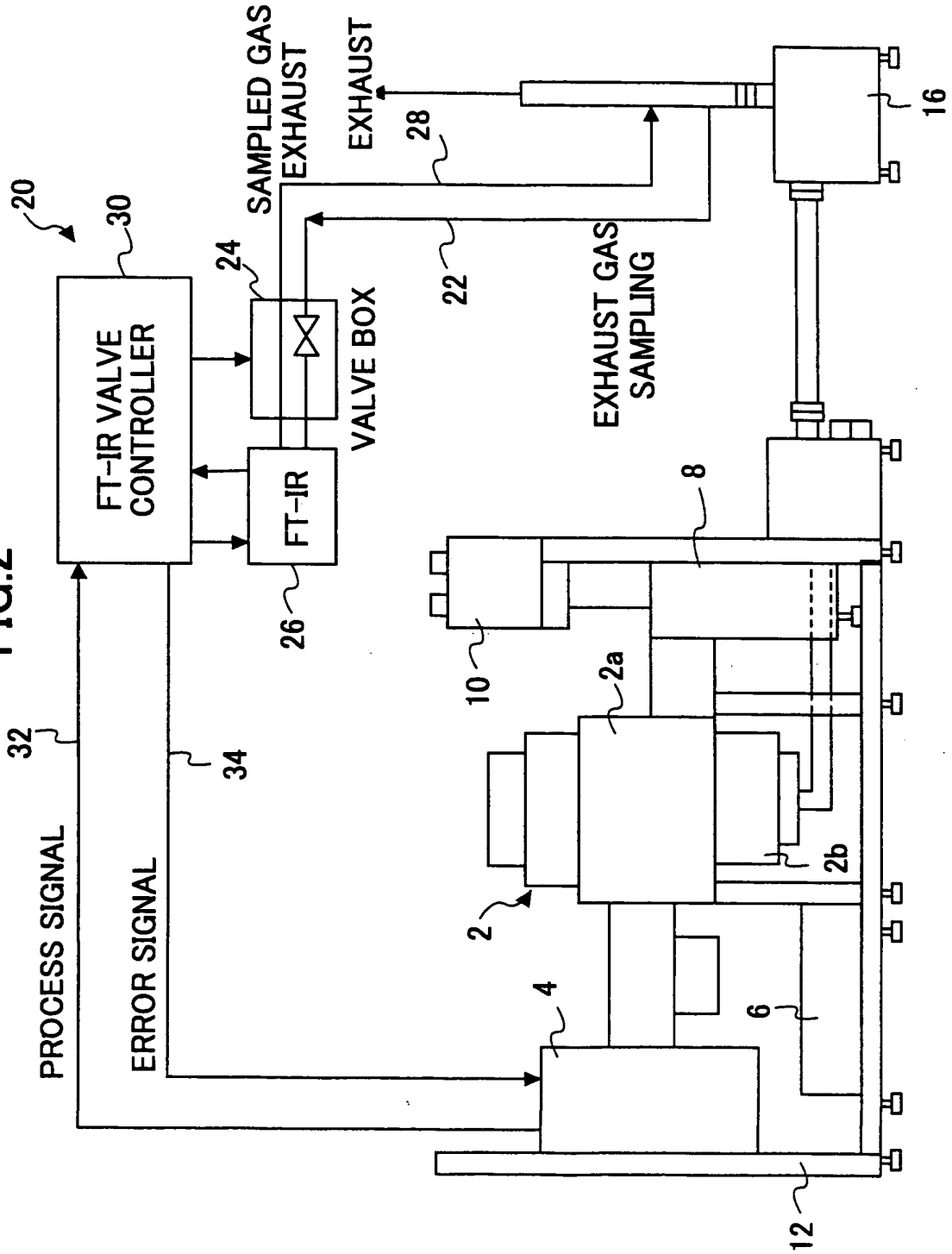

20
30
FT-IR VALVE CONTROLLER
24
VALVE BOX
SAMPLED GAS EXHAUST
EXHAUST
28
22
EXHAUST GAS SAMPLING
16
FT-IR
26
8
10
2a
2b
2
4
6
12
32
34
PROCESS SIGNAL
ERROR SIGNAL

FIG.3

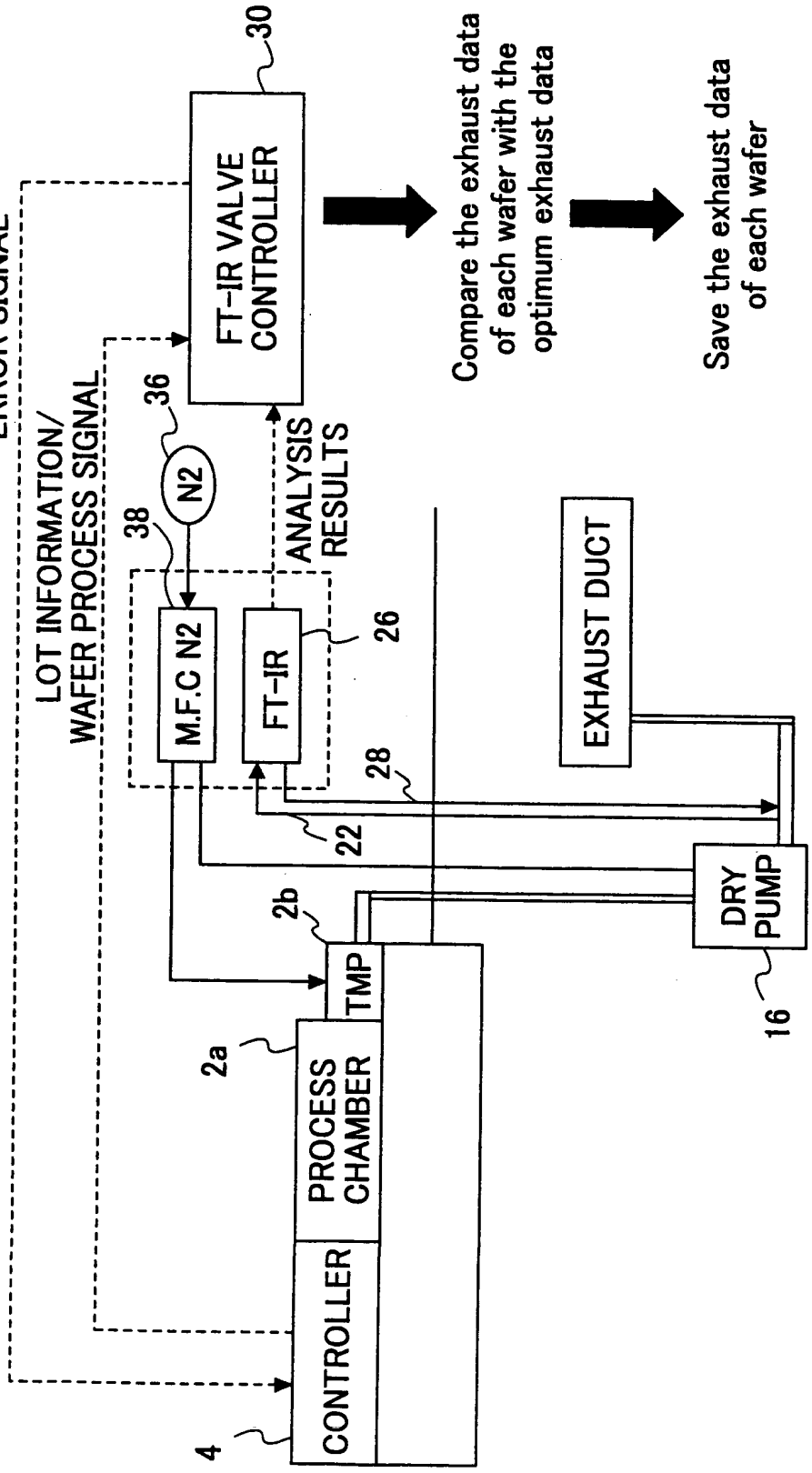

ERROR SIGNAL
LOT INFORMATION/
WAFER PROCESS SIGNAL
FT-IR VALVE CONTROLLER
30
36
N2
38
M.F.C N2
FT-IR
26
ANALYSIS RESULTS
Compare the exhaust data of each wafer with the optimum exhaust data
Save the exhaust data of each wafer
EXHAUST DUCT
28
22
2b
TMP
DRY PUMP
16
2a
PROCESS CHAMBER
CONTROLLER
4

FIG.4

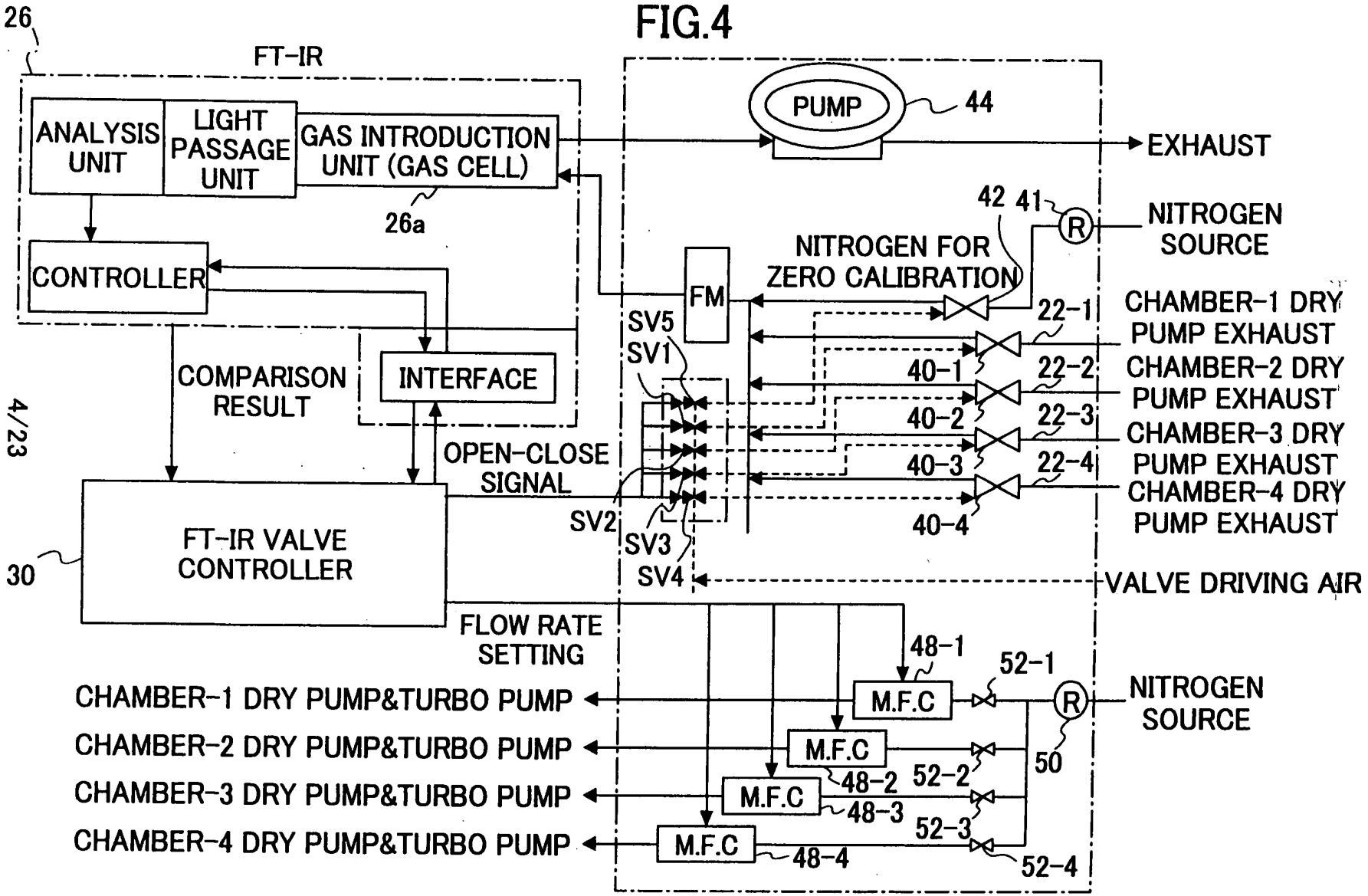

26
FT-IR
ANALYSIS UNIT
LIGHT PASSAGE UNIT
GAS INTRODUCTION UNIT (GAS CELL)
26a
CONTROLLER
INTERFACE
COMPARISON RESULT
OPEN-CLOSE SIGNAL
FT-IR VALVE CONTROLLER
30
FLOW RATE SETTING
PUMP
44
EXHAUST
42
41
R
NITROGEN SOURCE
NITROGEN FOR ZERO CALIBRATION
FM
SV5
SV1
SV2
SV3
SV4
40-1
40-2
40-3
40-4
22-1
22-2
22-3
22-4
CHAMBER-1 DRY PUMP EXHAUST
CHAMBER-2 DRY PUMP EXHAUST
CHAMBER-3 DRY PUMP EXHAUST
CHAMBER-4 DRY PUMP EXHAUST
VALVE DRIVING AIR
48-1
52-1
M.F.C
48-2
52-2
48-3
52-3
48-4
52-4
50
CHAMBER-1 DRY PUMP&TURBO PUMP
CHAMBER-2 DRY PUMP&TURBO PUMP
CHAMBER-3 DRY PUMP&TURBO PUMP
CHAMBER-4 DRY PUMP&TURBO PUMP

FIG.5

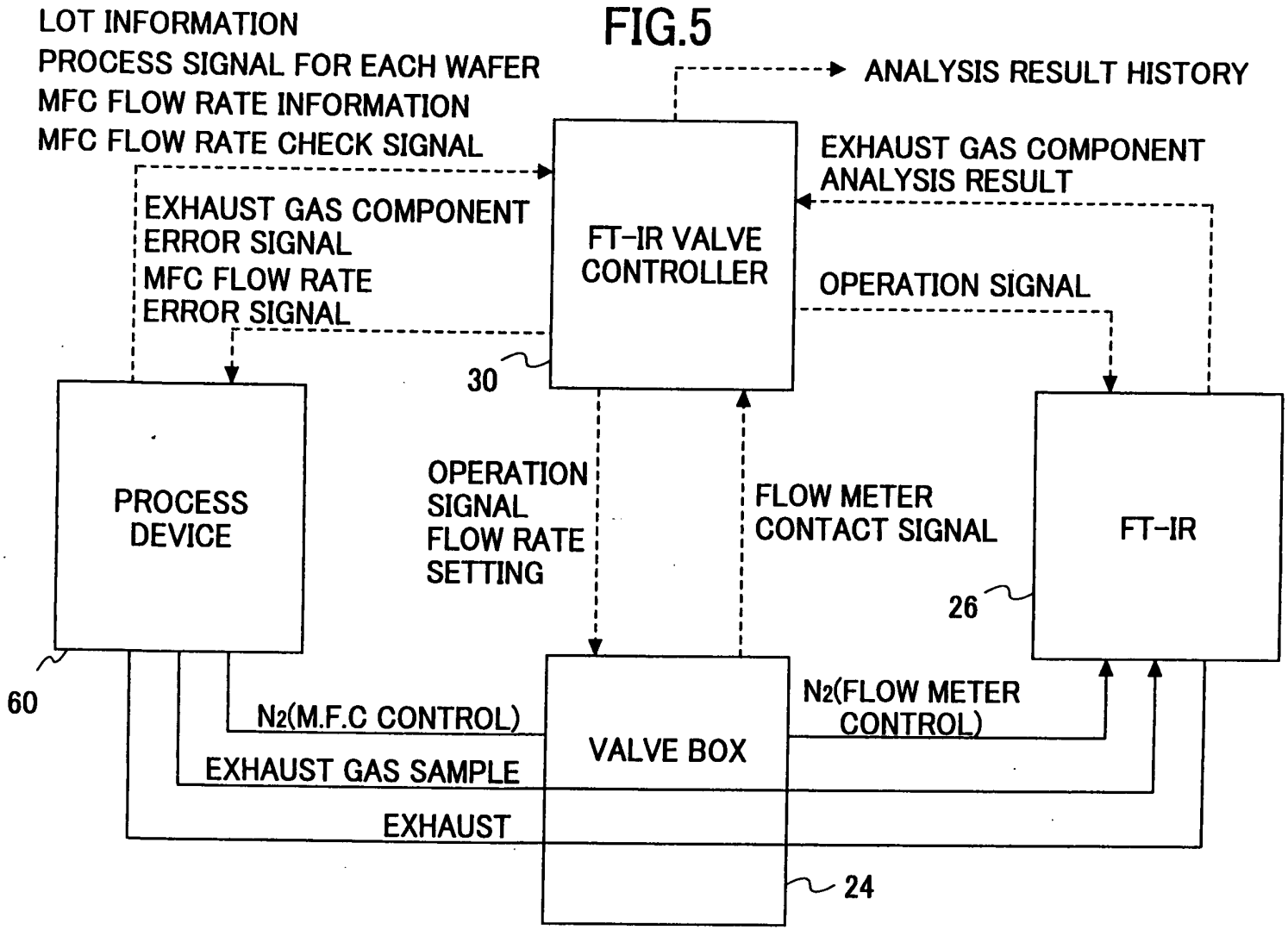

LOT INFORMATION
PROCESS SIGNAL FOR EACH WAFER
MFC FLOW RATE INFORMATION
MFC FLOW RATE CHECK SIGNAL
ANALYSIS RESULT HISTORY
EXHAUST GAS COMPONENT ANALYSIS RESULT
EXHAUST GAS COMPONENT ERROR SIGNAL
MFC FLOW RATE ERROR SIGNAL
FT-IR VALVE CONTROLLER
OPERATION SIGNAL
30
PROCESS DEVICE
OPERATION SIGNAL FLOW RATE SETTING
FLOW METER CONTACT SIGNAL
FT-IR
26
60
N2(M.F.C CONTROL)
VALVE BOX
N2(FLOW METER CONTROL)
EXHAUST GAS SAMPLE
EXHAUST
24

FIG.6

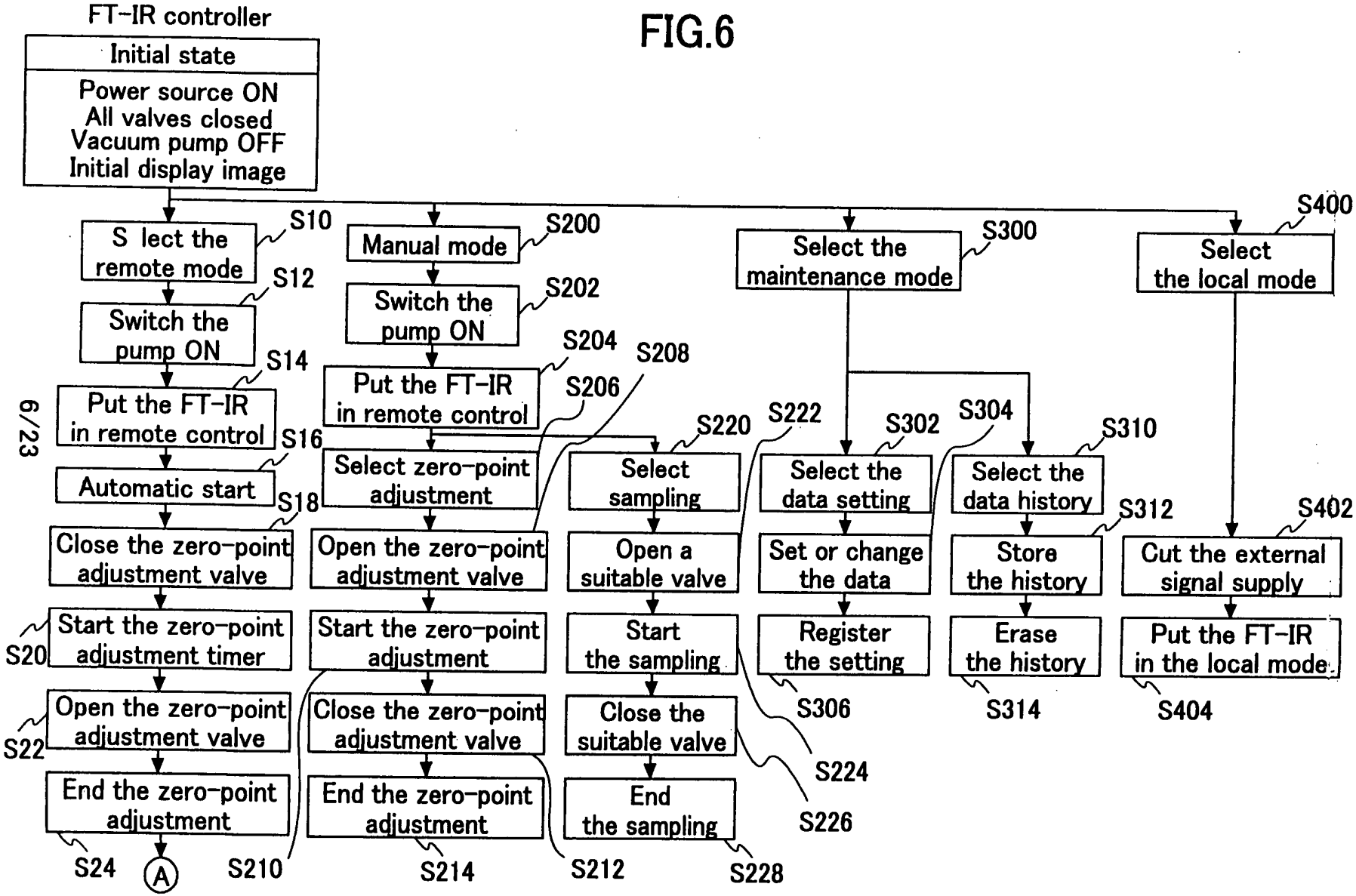

FT-IR controller
Initial state
Power source ON
All valves closed
Vacuum pump OFF
Initial display image
S lect the remote mode
S10
Switch the pump ON
S12
Put the FT-IR in remote control
S14
Automatic start
S16
Close the zero-point adjustment valve
S18
Start the zero-point adjustment timer
S20
Open the zero-point adjustment valve
S22
End the zero-point adjustment
S24
A
Manual mode
S200
Switch the pump ON
S202
Put the FT-IR in remote control
S204
Select zero-point adjustment
S206
Open the zero-point adjustment valve
S208
Start the zero-point adjustment
S210
Close the zero-point adjustment valve
S212
End the zero-point adjustment
S214
Select sampling
S220
Open a suitable valve
S222
Start the sampling
S224
Close the suitable valve
S226
End the sampling
S228
Select the maintenance mode
S300
Select the data setting
S302
Set or change the data
S304
Register the setting
S306
Select the data history
S310
Store the history
S312
Erase the history
S314
Select the local mode
S400
Cut the external signal supply
S402
Put the FT-IR in the local mode
S404

FIG.7

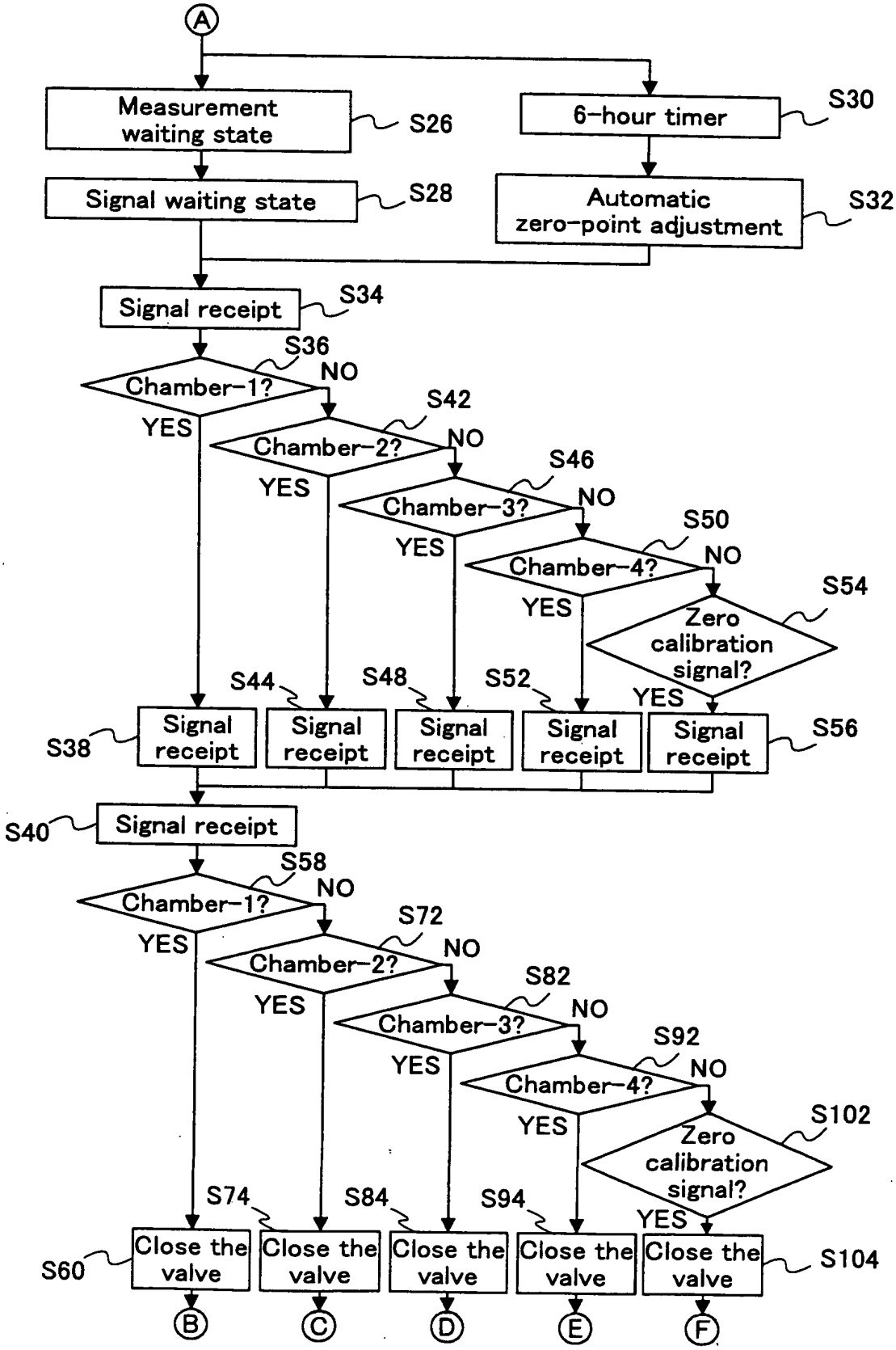

A
Measurement waiting state
S26
6-hour timer
S30
Signal waiting state
S28
Automatic zero-point adjustment
S32
Signal receipt
S34
S36
Chamber-1?
NO
YES
S42
Chamber-2?
NO
YES
S46
Chamber-3?
NO
YES
S50
Chamber-4?
NO
YES
S54
Zero calibration signal?
YES
S38
S44
S48
S52
S56
Signal receipt
Signal receipt
Signal receipt
Signal receipt
Signal receipt
S40
Signal receipt
S58
Chamber-1?
NO
YES
S72
Chamber-2?
NO
YES
S82
Chamber-3?
NO
YES
S92
Chamber-4?
NO
YES
S102
Zero calibration signal?
YES
S60
S74
S84
S94
S104
Close the valve
Close the valve
Close the valve
Close the valve
Close the valve
B
C
D
E
F

FIG.8

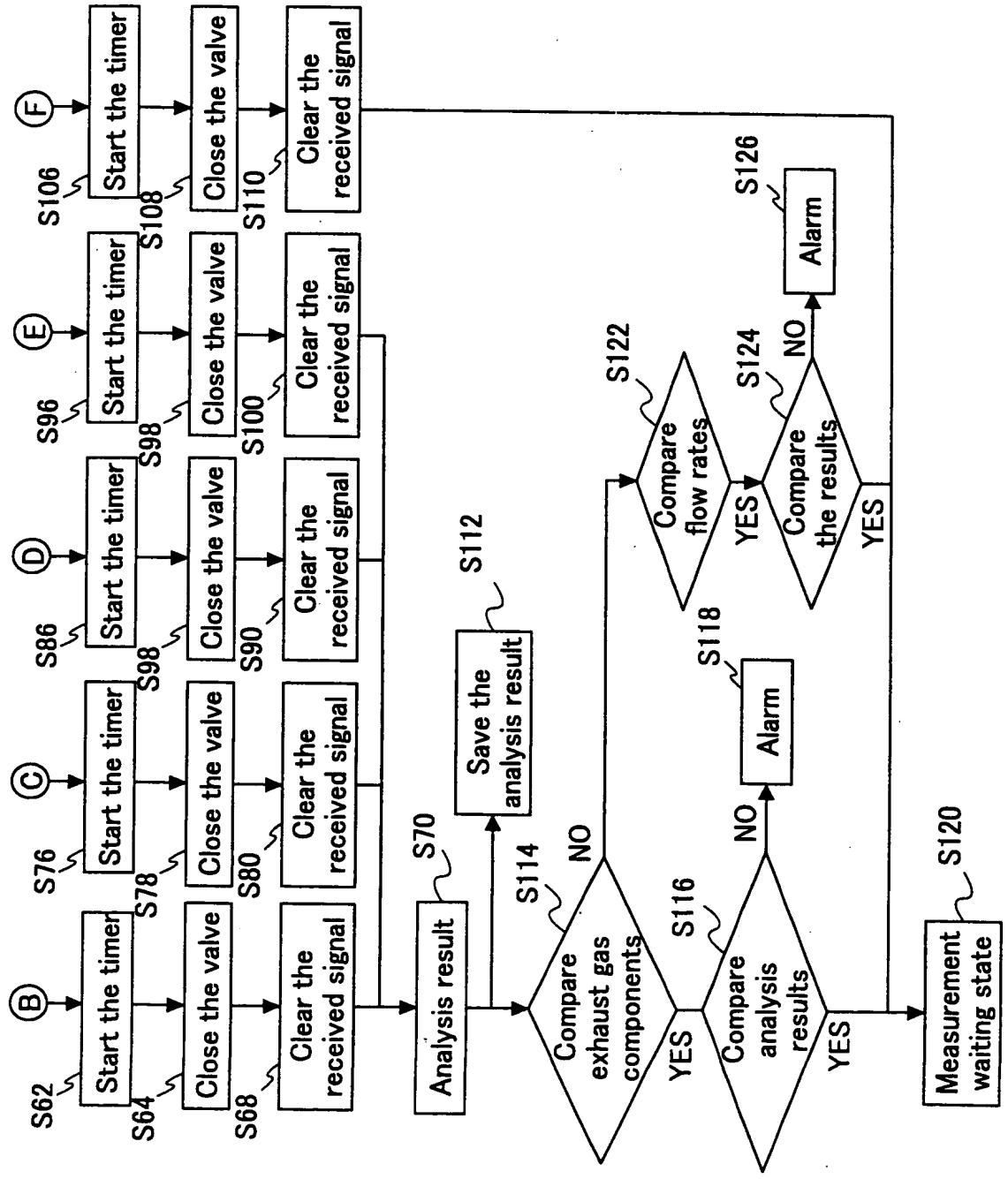

Start the timer
Close the valve
Clear the received signal
Analysis result
Save the analysis result
Compare exhaust gas components
Compare flow rates
Compare analysis results
Compare the results
Alarm
Measurement waiting state
YES
NO
S62
S64
S68
S70
S76
S78
S80
S86
S90
S96
S98
S100
S106
S108
S110
S112
S114
S116
S118
S120
S122
S124
S126
B
C
D
E
F

FIG.9

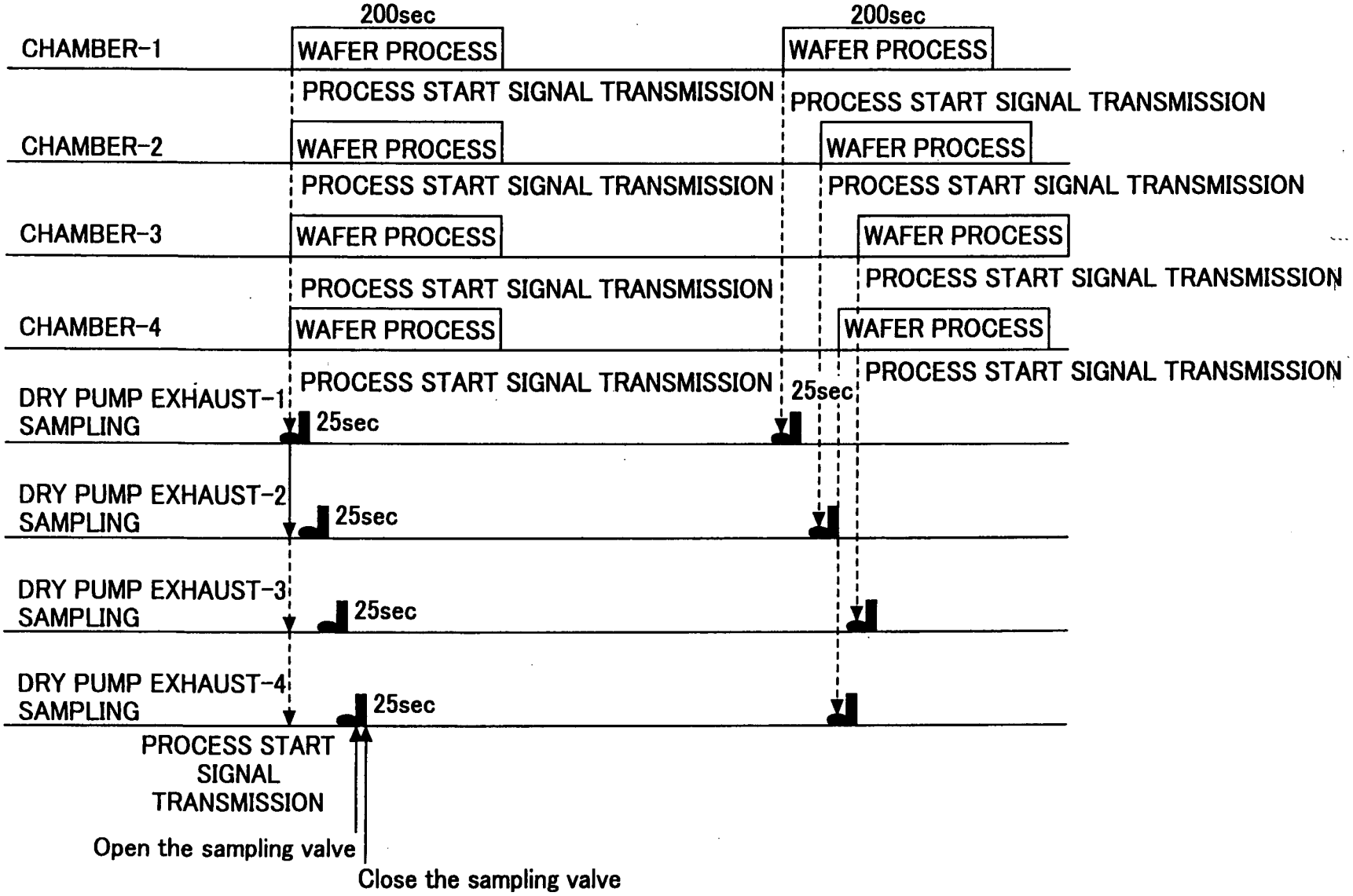

200sec
200sec
CHAMBER-1
WAFER PROCESS
WAFER PROCESS
PROCESS START SIGNAL TRANSMISSION
PROCESS START SIGNAL TRANSMISSION
CHAMBER-2
WAFER PROCESS
WAFER PROCESS
PROCESS START SIGNAL TRANSMISSION
PROCESS START SIGNAL TRANSMISSION
CHAMBER-3
WAFER PROCESS
WAFER PROCESS
PROCESS START SIGNAL TRANSMISSION
PROCESS START SIGNAL TRANSMISSION
CHAMBER-4
WAFER PROCESS
WAFER PROCESS
PROCESS START SIGNAL TRANSMISSION
PROCESS START SIGNAL TRANSMISSION
25sec
DRY PUMP EXHAUST-1 SAMPLING
25sec
DRY PUMP EXHAUST-2 SAMPLING
25sec
DRY PUMP EXHAUST-3 SAMPLING
25sec
DRY PUMP EXHAUST-4 SAMPLING
25sec
PROCESS START SIGNAL TRANSMISSION
Open the sampling valve
Close the sampling valve

FIG.10

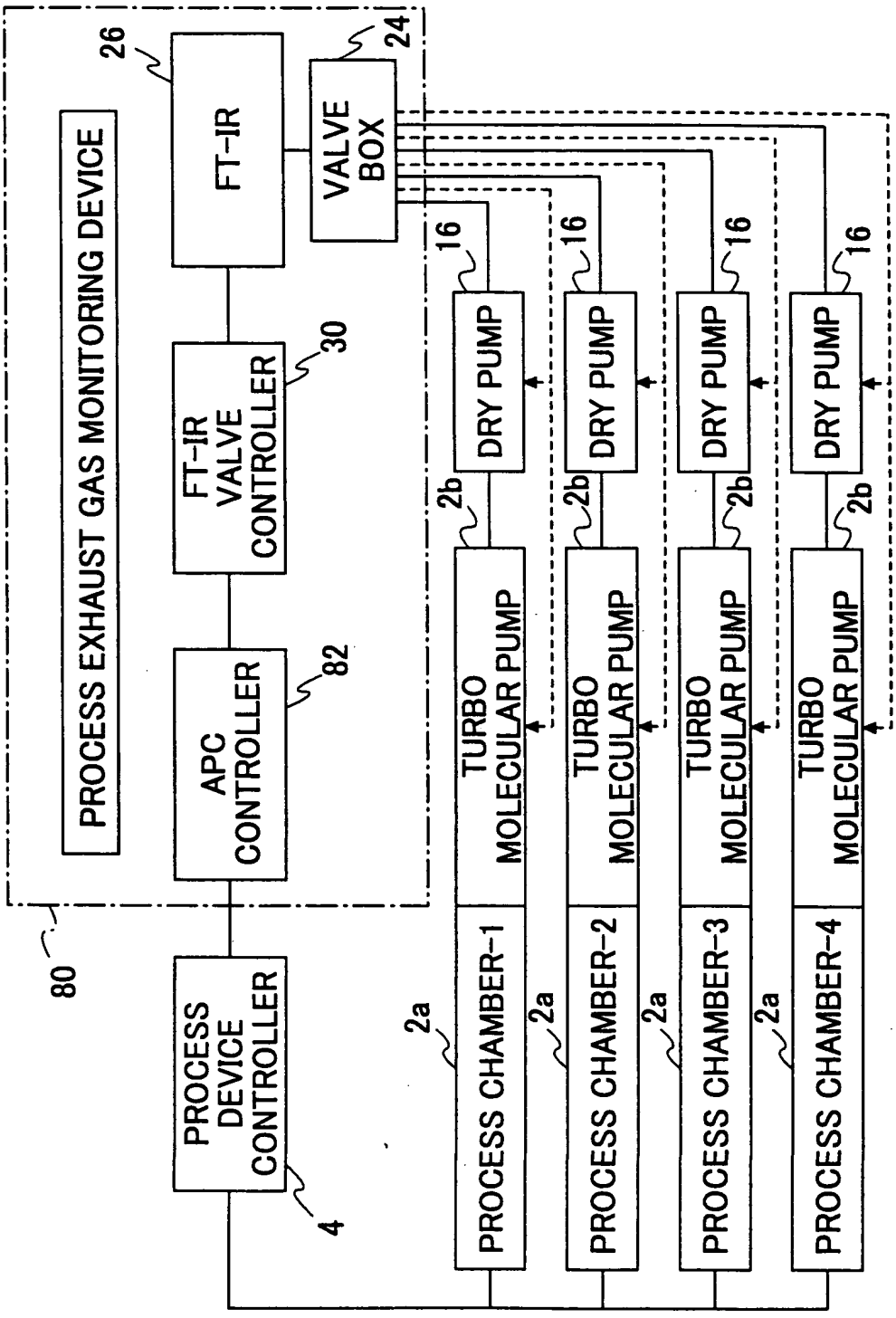

80
PROCESS EXHAUST GAS MONITORING DEVICE
PROCESS DEVICE CONTROLLER
4
APC CONTROLLER
82
FT-IR VALVE CONTROLLER
30
FT-IR
26
VALVE BOX
24
PROCESS CHAMBER-1
PROCESS CHAMBER-2
PROCESS CHAMBER-3
PROCESS CHAMBER-4
2a
TURBO MOLECULAR PUMP
2b
DRY PUMP
16

FIG.11

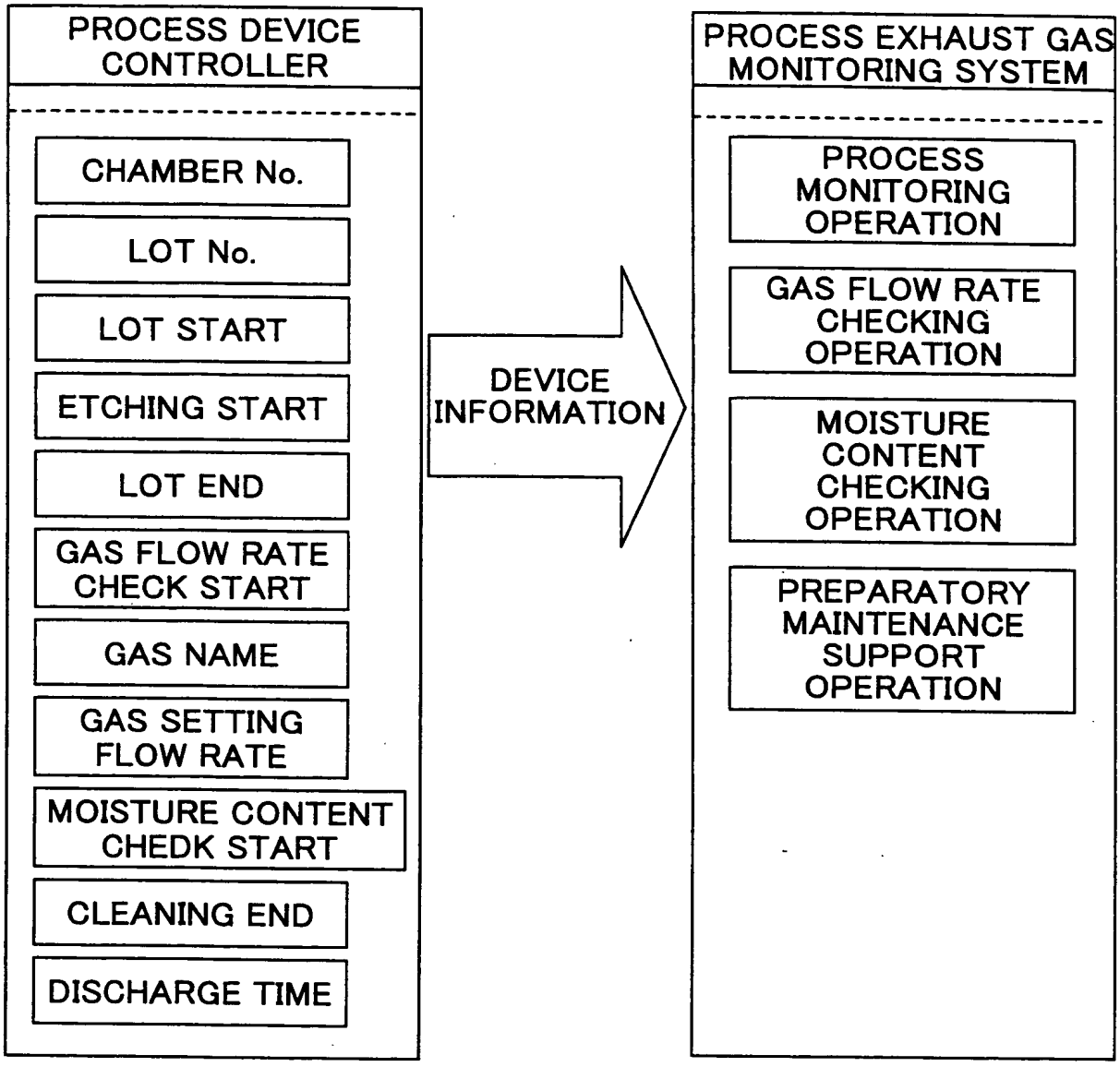

PROCESS DEVICE CONTROLLER
CHAMBER No.
LOT No.
LOT START
ETCHING START
LOT END
GAS FLOW RATE CHECK START
GAS NAME
GAS SETTING FLOW RATE
MOISTURE CONTENT CHEDK START
CLEANING END
DISCHARGE TIME
DEVICE INFORMATION
PROCESS EXHAUST GAS MONITORING SYSTEM
PROCESS MONITORING OPERATION
GAS FLOW RATE CHECKING OPERATION
MOISTURE CONTENT CHECKING OPERATION
PREPARATORY MAINTENANCE SUPPORT OPERATION

FIG.12

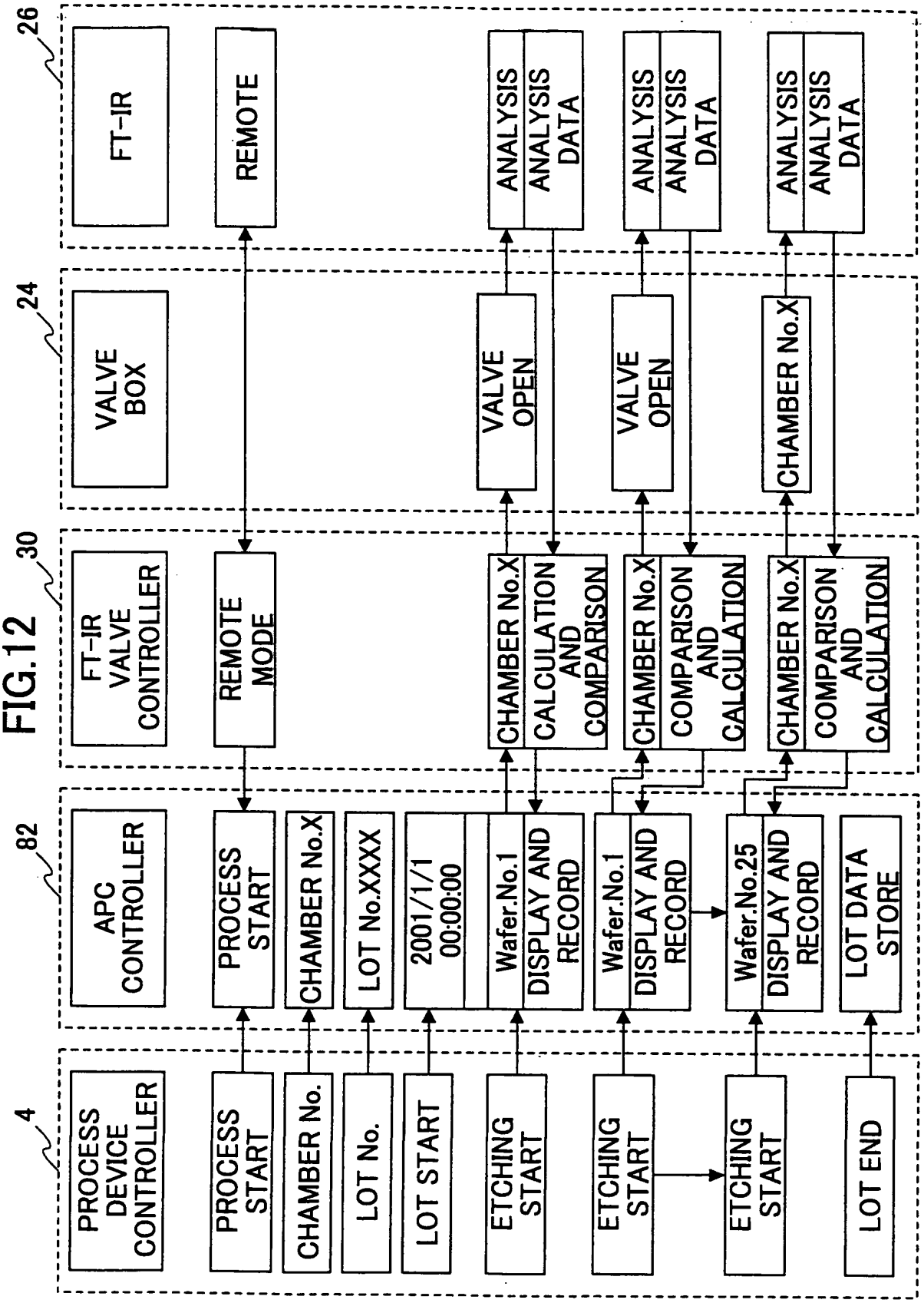

4
PROCESS DEVICE CONTROLLER
PROCESS START
CHAMBER No.
LOT No.
LOT START
ETCHING START
ETCHING START
ETCHING START
LOT END
82
APC CONTROLLER
PROCESS START
CHAMBER No.X
LOT No.XXXX
2001/1/1 00:00:00
Wafer.No.1
DISPLAY AND RECORD
Wafer.No.1
DISPLAY AND RECORD
Wafer.No.25
DISPLAY AND RECORD
LOT DATA STORE
30
FT-IR VALVE CONTROLLER
REMOTE MODE
CHAMBER No.X
CALCULATION AND COMPARISON
CHAMBER No.X
COMPARISON AND CALCULATION
CHAMBER No.X
COMPARISON AND CALCULATION
24
VALVE BOX
VALVE OPEN
VALVE OPEN
CHAMBER No.X
26
FT-IR
REMOTE
ANALYSIS
ANALYSIS DATA
ANALYSIS
ANALYSIS DATA
ANALYSIS
ANALYSIS DATA

FIG.13

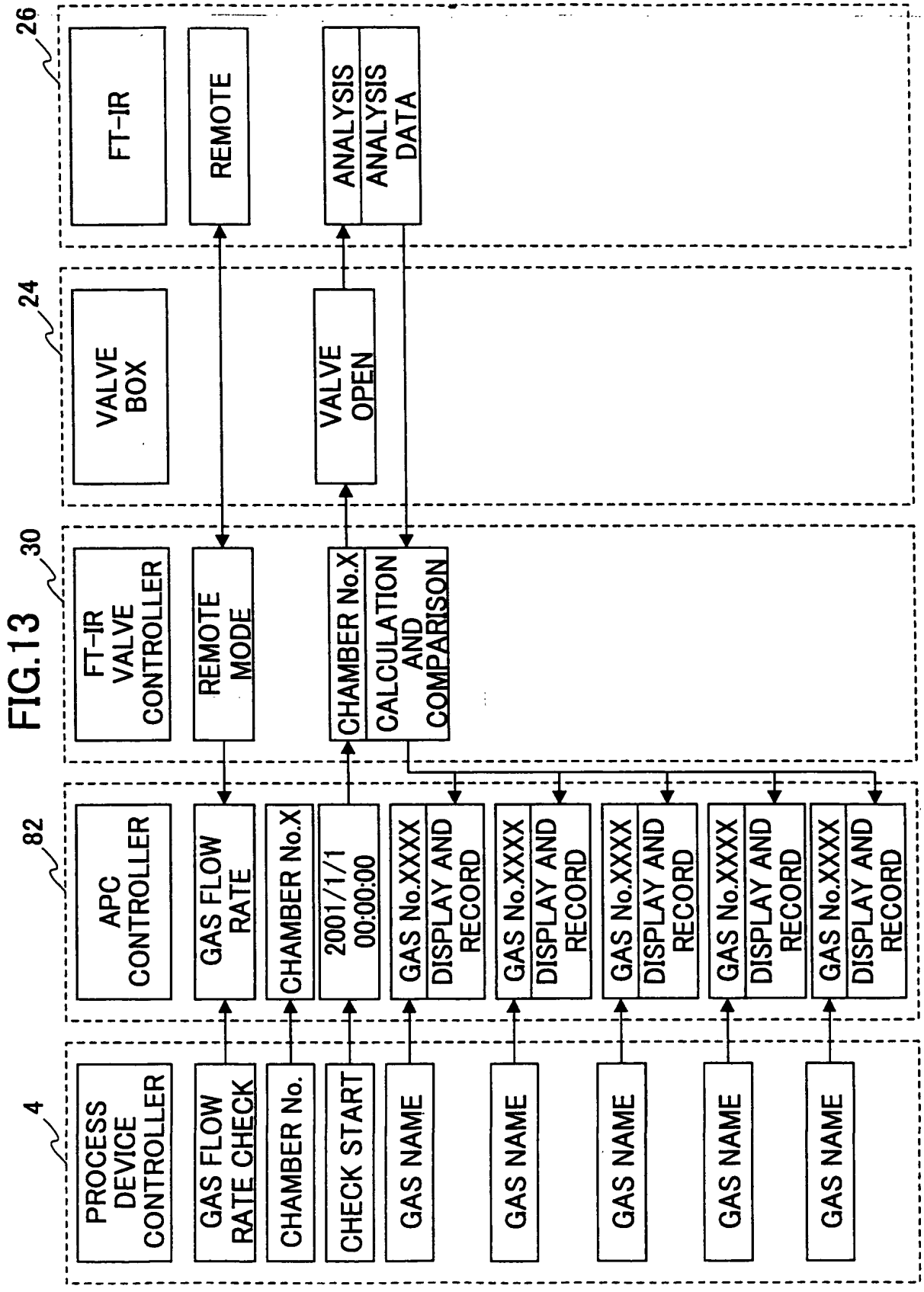

26
FT-IR
REMOTE
ANALYSIS
ANALYSIS DATA
24
VALVE BOX
VALVE OPEN
30
FT-IR VALVE CONTROLLER
REMOTE MODE
CHAMBER No.X
CALCULATION AND COMPARISON
82
APC CONTROLLER
GAS FLOW RATE
CHAMBER No.X
2001/1/1 00:00:00
GAS No.XXXX
DISPLAY AND RECORD
4
PROCESS DEVICE CONTROLLER
GAS FLOW RATE CHECK
CHAMBER No.
CHECK START
GAS NAME

FIG.14

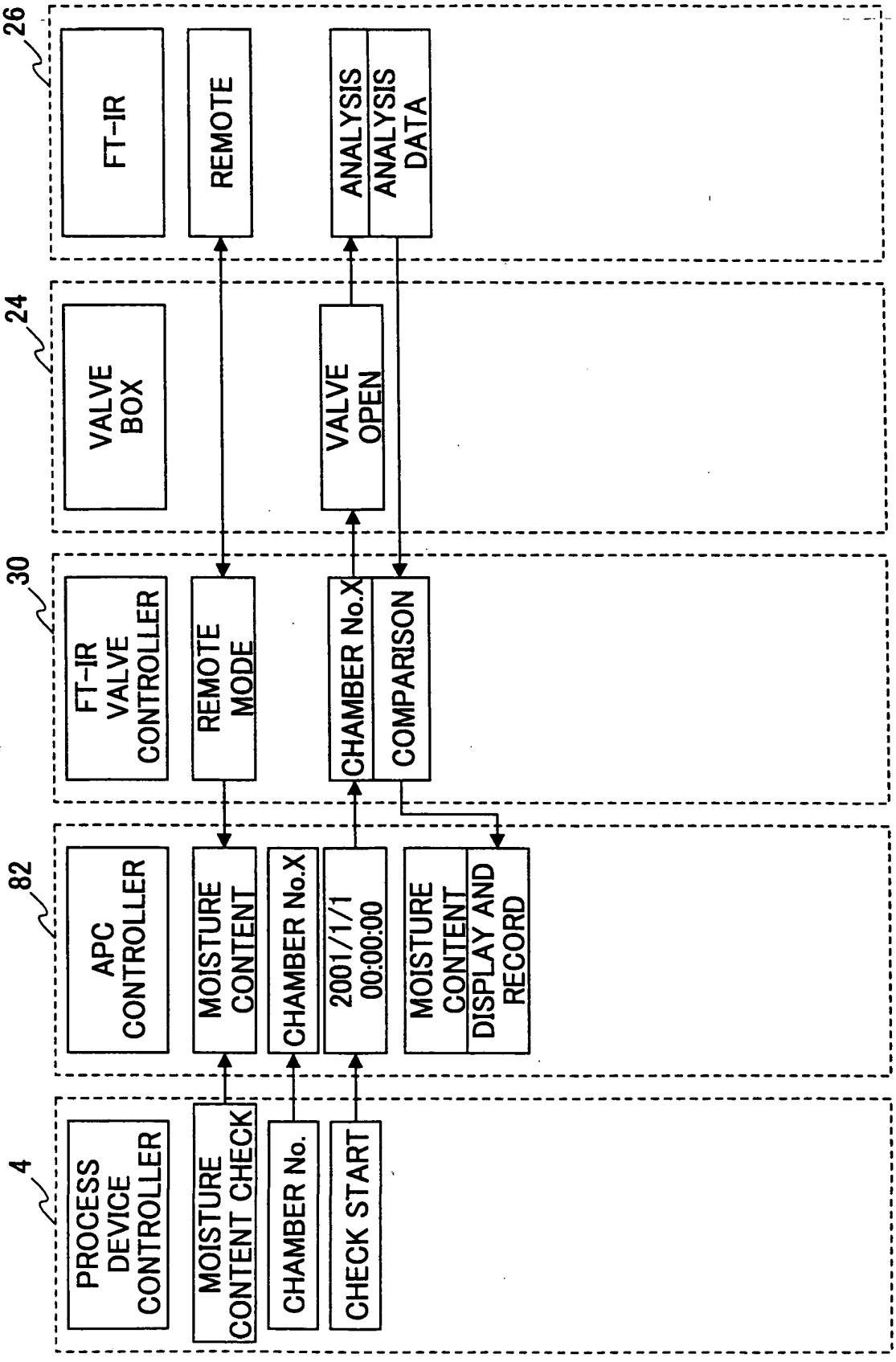

26
FT-IR
REMOTE
ANALYSIS
ANALYSIS DATA
24
VALVE BOX
VALVE OPEN
30
FT-IR VALVE CONTROLLER
REMOTE MODE
CHAMBER No.X
COMPARISON
82
APC CONTROLLER
MOISTURE CONTENT
CHAMBER No.X
2001/1/1 00:00:00
MOISTURE CONTENT
DISPLAY AND RECORD
4
PROCESS DEVICE CONTROLLER
MOISTURE CONTENT CHECK
CHAMBER No.
CHECK START

FIG.15

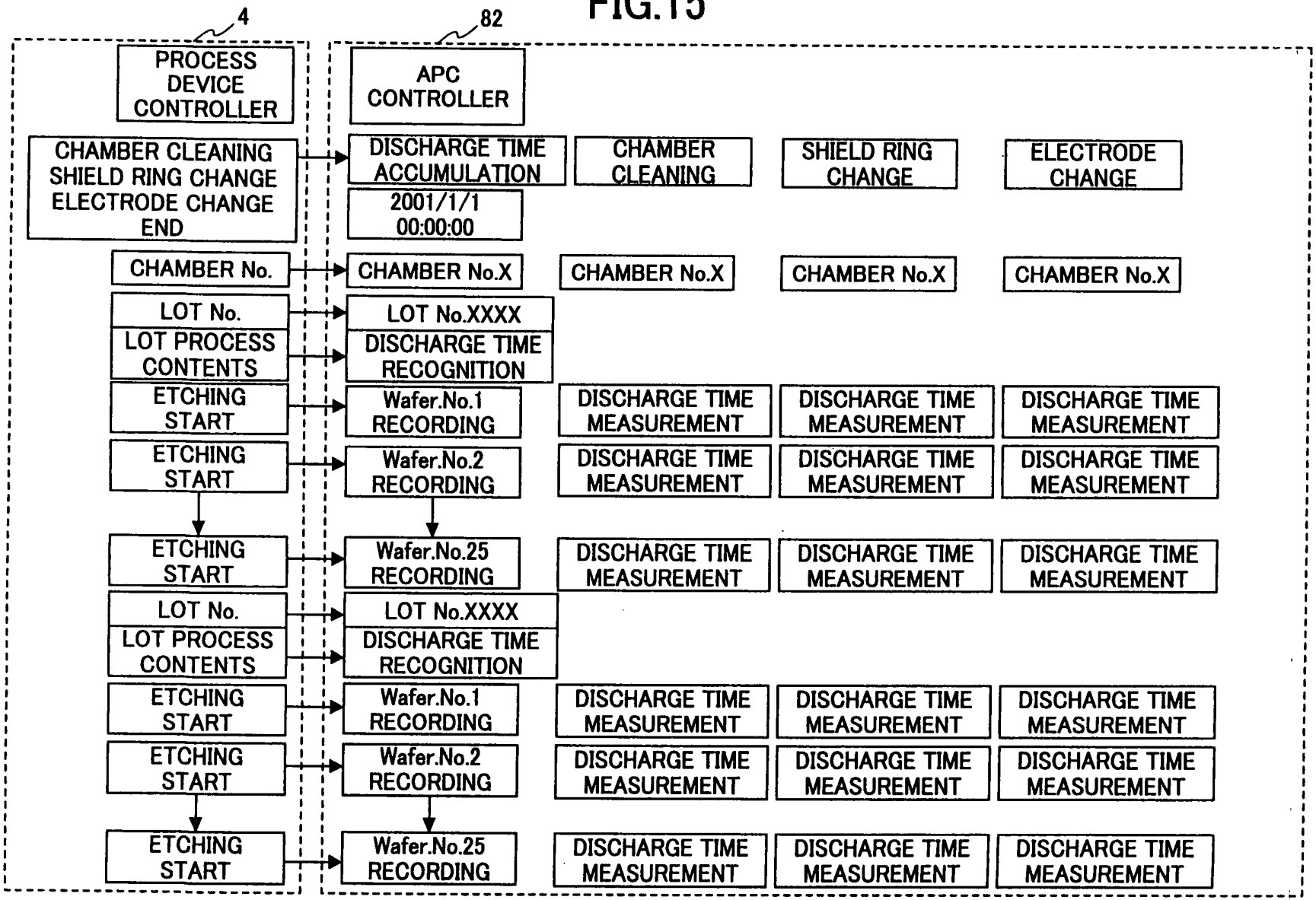

4
82
PROCESS DEVICE CONTROLLER
APC CONTROLLER
CHAMBER CLEANING SHIELD RING CHANGE ELECTRODE CHANGE END
DISCHARGE TIME ACCUMULATION
CHAMBER CLEANING
SHIELD RING CHANGE
ELECTRODE CHANGE
2001/1/1 00:00:00
CHAMBER No.
CHAMBER No.X
CHAMBER No.X
CHAMBER No.X
CHAMBER No.X
LOT No.
LOT No.XXXX
LOT PROCESS CONTENTS
DISCHARGE TIME RECOGNITION
ETCHING START
Wafer.No.1 RECORDING
DISCHARGE TIME MEASUREMENT
DISCHARGE TIME MEASUREMENT
DISCHARGE TIME MEASUREMENT
ETCHING START
Wafer.No.2 RECORDING
DISCHARGE TIME MEASUREMENT
DISCHARGE TIME MEASUREMENT
DISCHARGE TIME MEASUREMENT
ETCHING START
Wafer.No.25 RECORDING
DISCHARGE TIME MEASUREMENT
DISCHARGE TIME MEASUREMENT
DISCHARGE TIME MEASUREMENT
LOT No.
LOT No.XXXX
LOT PROCESS CONTENTS
DISCHARGE TIME RECOGNITION
ETCHING START
Wafer.No.1 RECORDING
DISCHARGE TIME MEASUREMENT
DISCHARGE TIME MEASUREMENT
DISCHARGE TIME MEASUREMENT
ETCHING START
Wafer.No.2 RECORDING
DISCHARGE TIME MEASUREMENT
DISCHARGE TIME MEASUREMENT
DISCHARGE TIME MEASUREMENT
ETCHING START
Wafer.No.25 RECORDING
DISCHARGE TIME MEASUREMENT
DISCHARGE TIME MEASUREMENT
DISCHARGE TIME MEASUREMENT

FIG.16

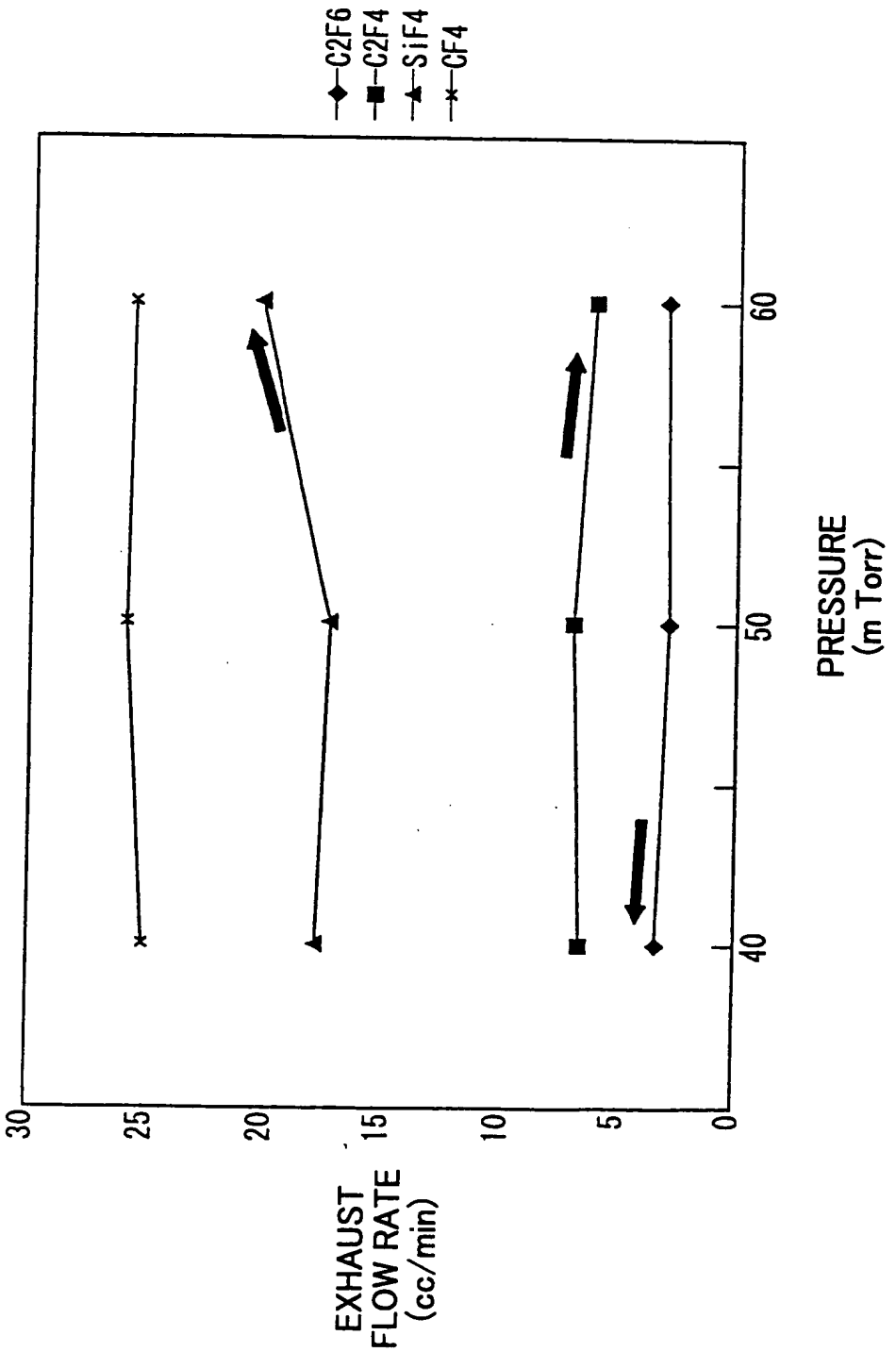

C2F6
C2F4
SiF4
CF4
EXHAUST FLOW RATE (cc/min)
30
25
20
15
10
5
0
PRESSURE (m Torr)
40
50
60

FIG.17

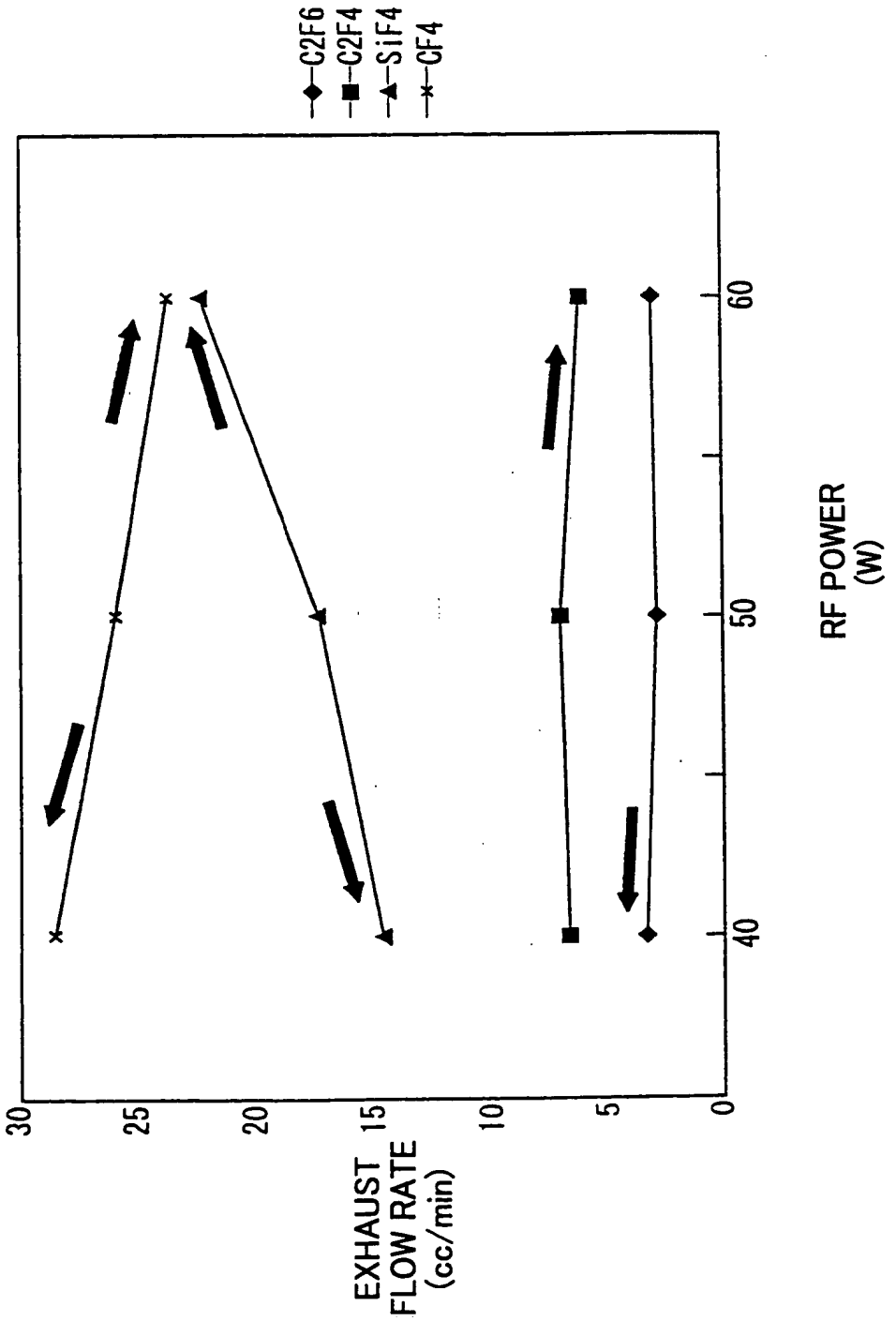

C2F6
C2F4
SiF4
CF4
EXHAUST FLOW RATE (cc/min)
0
5
10
15
20
25
30
RF POWER (W)
40
50
60

FIG.18

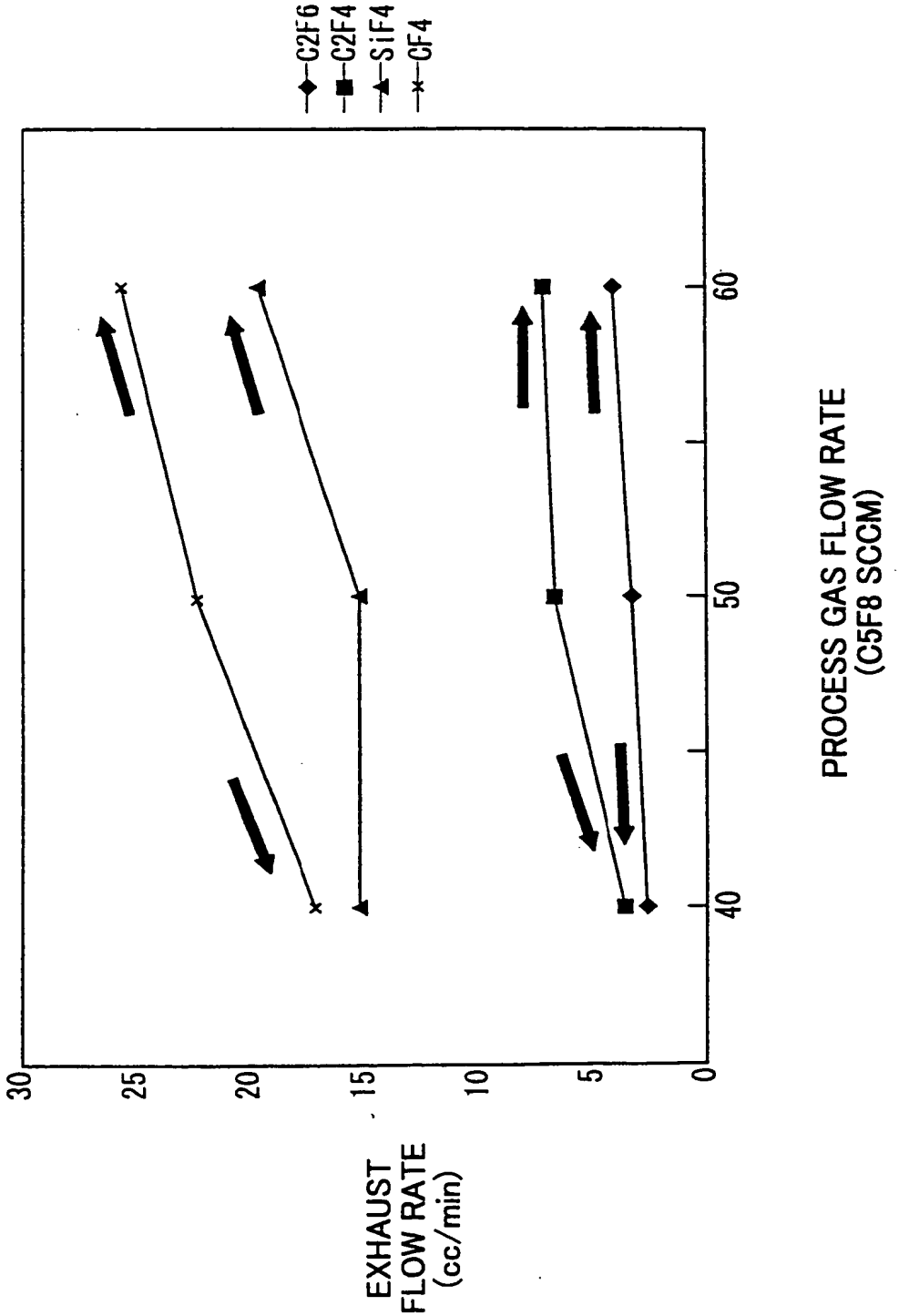

C2F6
C2F4
SiF4
CF4
30
25
20
15
10
5
0
40
50
60
EXHAUST FLOW RATE (cc/min)
PROCESS GAS FLOW RATE (C5F8 SCCM)

FIG.19A CF4

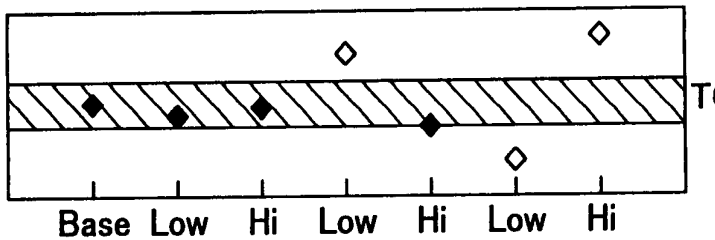


FIG.19B SiF4

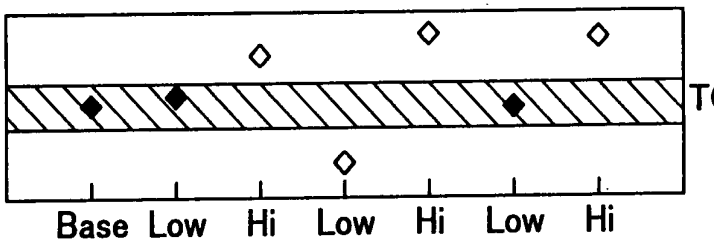


FIG.19C C2F4

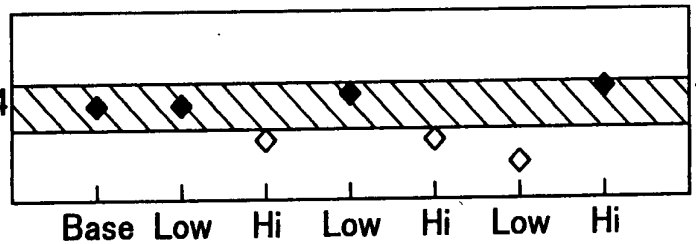


FIG.19D C2F6

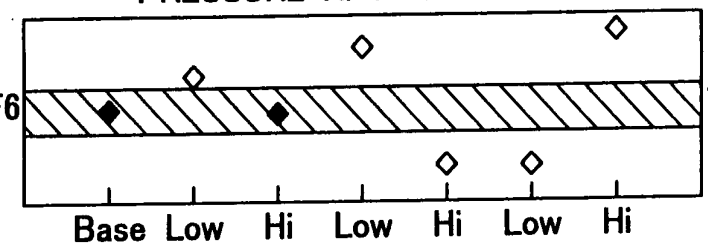


FIG.20

PARAMETER \ GAS TYPE		CF4	SiF4	C2F4	C2F6	RECOGNITION SIGNAL
CHAMBER INNER PRESSURE	Low	◆	◆	◆	◇	0001
		0	0	0	1	
	Hi	◆	◇	◇	◆	0110
		0	1	1	0	
RF POWER	Low	◇	◇	◆	◇	1101
		1	1	0	1	
	Hi	◆	◇	◇	◇	0111
		0	1	1	1	
GAS FLOW RATE (C5F8)	Low	◇	◆	◇	◇	1011
		1	0	1	1	
	Hi	◇	◇	◇	◇	1111
		1	1	1	1	

FIG.21

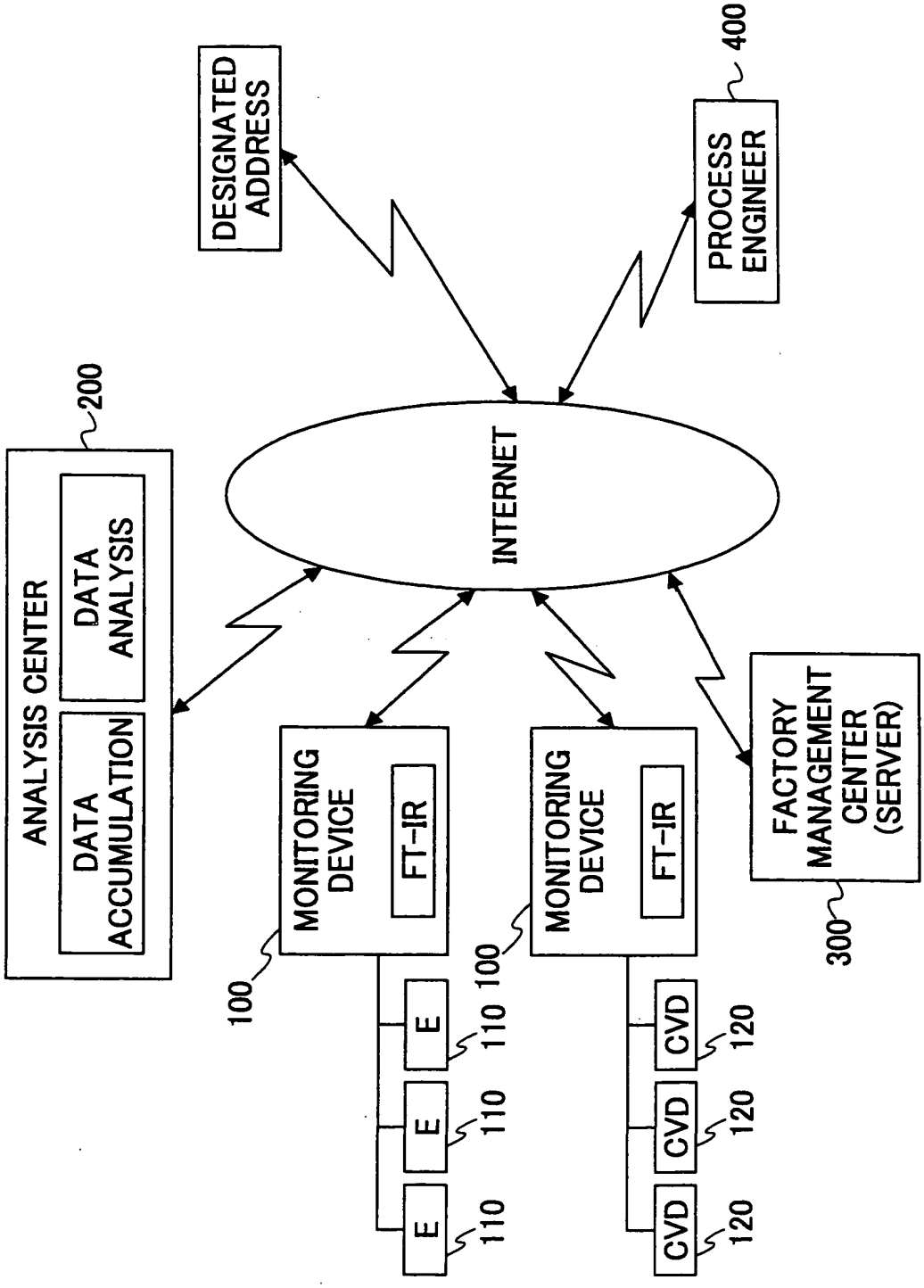

DESIGNATED ADDRESS
400
PROCESS ENGINEER
INTERNET
200
ANALYSIS CENTER
DATA ANALYSIS
DATA ACCUMULATION
MONITORING DEVICE
FT-IR
100
E
110
CVD
120
FACTORY MANAGEMENT CENTER (SERVER)
300

FIG.22

DISPLAY SCREEN

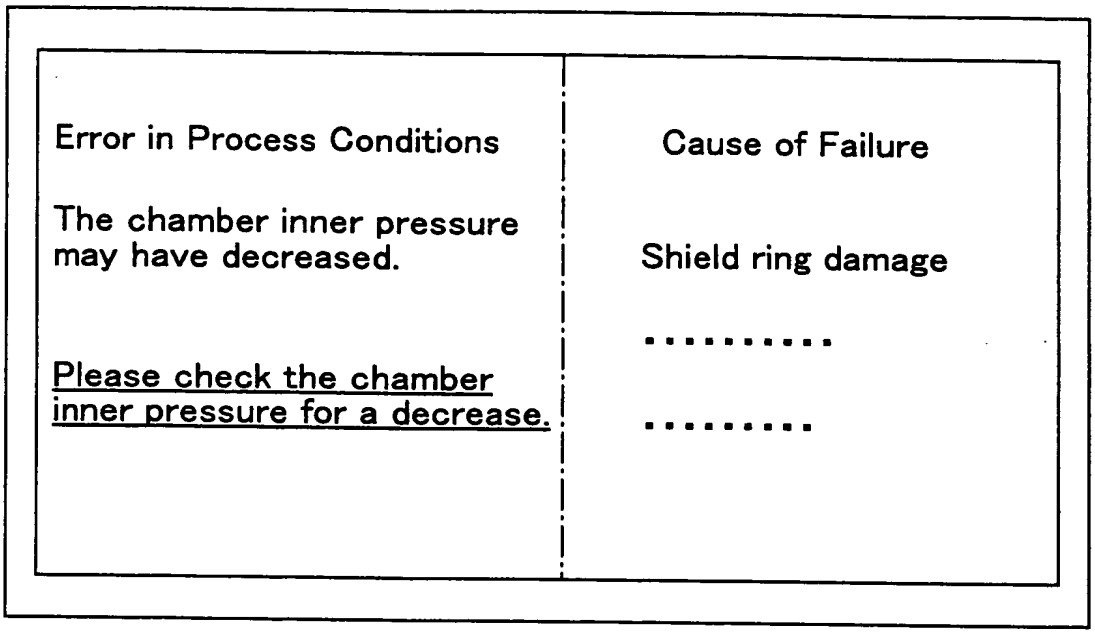
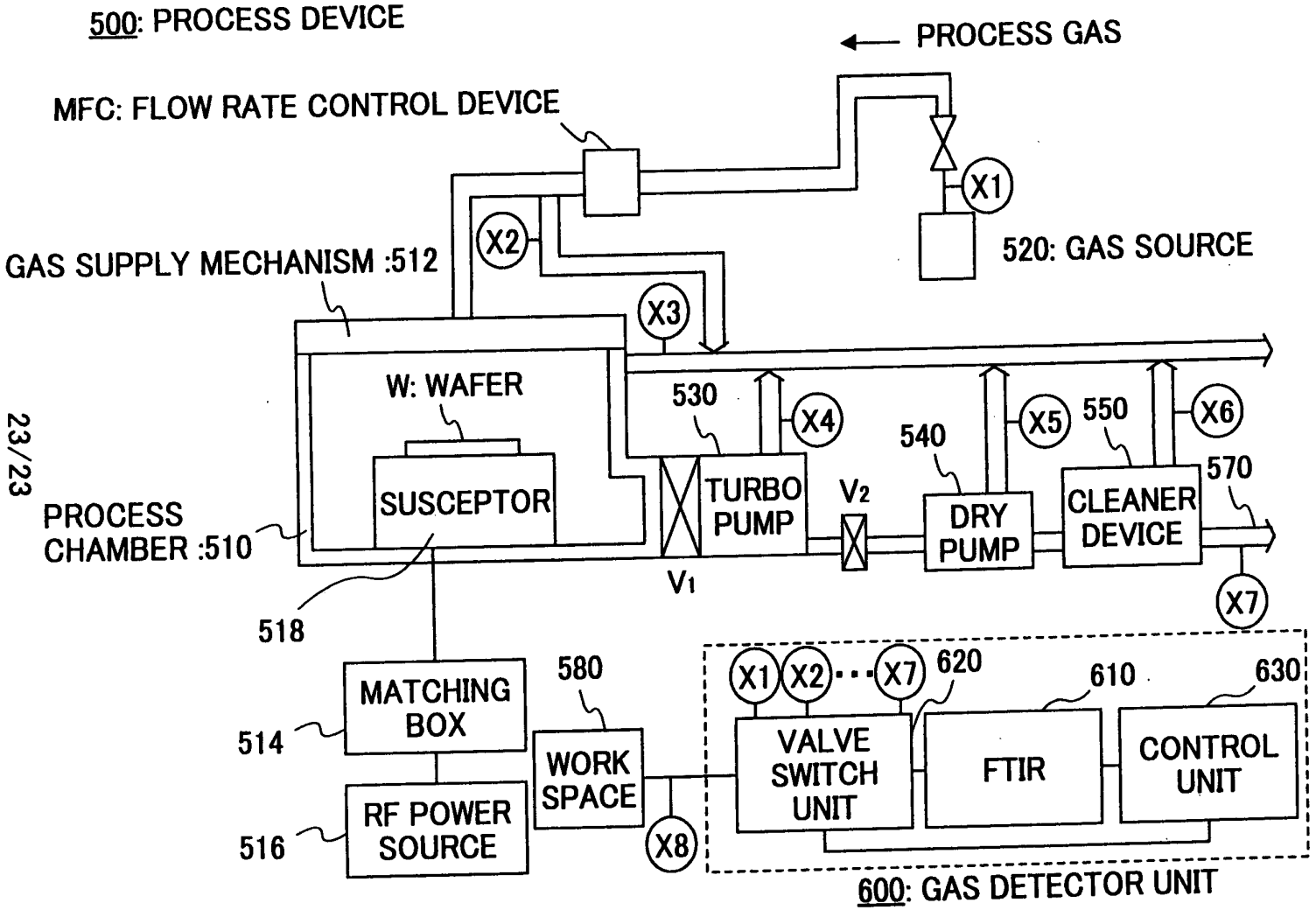


FIG.23


500: PROCESS DEVICE
PROCESS GAS
MFC: FLOW RATE CONTROL DEVICE
X1
520: GAS SOURCE
X2
GAS SUPPLY MECHANISM :512
X3
W: WAFER
530
X4
540
X5
550
X6
570
SUSCEPTOR
TURBO PUMP
V2
DRY PUMP
CLEANER DEVICE
PROCESS CHAMBER :510
V1
X7
518
MATCHING BOX
580
514
WORK SPACE
X1
X2
X7
620
610
630
VALVE SWITCH UNIT
FTIR
CONTROL UNIT
RF POWER SOURCE
516
X8
600: GAS DETECTOR UNIT